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WEATHER AND CROP.

The month of January was marked by unusually cold and dry weather. It has been the coldest January within the period covered by weather records.

Except in a few sections of the Islands dry weather prevailed, in consequence of which streams, even in the windward districts ran low, and shortage of water very seriously interfered in many places with the grinding of cane.

The 1905 crop of cane has in consequence of the cold weather ripened slowly and the young cane has made practically no growth.

Toward the end of the month conditions improved somewhat and most of the mills are now grinding though not steadily.

JAVA PROCESS OF BOILING.

At the annual meeting of the Hawaiian Sugar Planters' Association held last November, there was read in connection with the Report on Manufacture, a paper written by Mr. Johnson, chemist for Waialua Agricultural Company, giving comparative results of the Java process of boiling and the old process.

Mr. Goodale, Manager of Waialua Company, at the meeting expressed a desire to review the paper and make explanations as to certain statements therein. He now offers the report for publication, and we are sure it will be of interest to many planters.

Waialua, Oahu, January 31st, 1905.

Editor Planters' Monthly, Honolulu.

Dear Sir: During the crop of 1904 Mr. K. R. Hamakers, chemist and sugar manufacturer, who has had long and varied experience in Holland, Germany and Java, visited these islands. While here he was given an opportunity in several mills to work what is called the "Java Process" of sugar manufacture, an important feature of which is the use of crystallizers, in which the process of crystallization in motion is carried on.

The Waialua mill being well equipped with the necessary machinery, vacuum pans of ample size, crystallizers sufficient in number and large enough to hold full strikes from the pans, large water-driven centrifugals and Hersey Dryers, it was decided to make a careful test of the Java Process in this mill. In order to give Mr. Hamakers every chance to make the test conclusive, the mill was stopped for three days and all the juice and molasses resulting from the old process in use was boiled and taken out of the way. All the machinery in the mill and boiling house was then put under the direct control of Mr. Hamakers, and he had full charge during the time the test was being made.

The following report of the work done was prepared by Mr. Horace Johnson, chemist.

The large quantity of extra fuel used needs some explanation. During the 17 weeks' run in the early part of the year, the juices were of very low density and purity; percentage of fiber in the cane low. There were heavy rains, and consequently great difficulty in getting cane to the mill. During the eleven weeks of the Java Process the mill ran more steadily, though not to its full capacity. During the six weeks of the latter part of the crop, we were short of labor and could not make full time. The percentage of fiber in the cane was low during the entire crop, but the extraction exceeded 95% of the total sugar in the cane. These results could not have been obtained without the use of extra fuel.

Grinding the crop of 1905 at Waialua was begun on December 5th last, and the manufacture of the sugar is now being carried on by the Java Process only. There can be no doubt that by this process the sugar can be quickly turned out and marketed; that the process is simpler, cleaner, and requires less labor than the old way, and the waste molasses is as low in sugar as by the other process.

Very truly yours,

WM. W. GOODALE,
Manager Waialua Agricultural Company, Ltd.

A COMPARISON OF THE RESULTS OF THE "JAVA PROCESS" OF BOILING, AND THE "OLD PROCESS."

To save time, to increase the production, and to lessen the cost of the same, are points which the manufacturer of today is constantly striving to obtain. Work along these lines in the manufacture of sugar resulted in the introduction of crystallizers and sugar driers.

With these additions changes necessarily came in the methods of boiling, the aim being to produce marketable sugar and exhausted molasses from the same massecuite. With this end in view, all methods are based on the fact that by a systematic boiling of syrup and molasses a constant difference is obtained between the purity of the massecuite and the purity of the molasses from the centrifugals. This difference holds true until the purity of the massecuits reaches a limit where the great amount of soluble impurities prevents the further crystallization of the sucrose, and the further exhaustion of the molasses. In different countries and in different mills the principle remains the same, but on account of local conditions the details of manipulation are often changed.

The Java process of boiling, the result of many years of practical experience, is as follows:

The proportions of syrup and molasses which can be boiled to the best advantage, for each degree of purity of the massecuite, are first determined. To facilitate the use of this knowledge the vacuum pan is measured, and the measurements marked on the outside of the pan.

A strike of the desired quantity of syrup is boiled to + 94° Brix. A charge of molasses is then taken in and boiled to + 95° Brix. This is repeated until the last charge is taken, when great care should be exercised to prevent the massecuite from becoming too heavy. The massecuite should be let out of the pan thin enough to dry readily after cooling. If too heavy, molasses may be added to the massecuite while in the crystallizer, but this should be avoided if possible.

The molasses used for charges should be heated to about 10° higher than the temperature of the pan. This dissolves any fine grain in the molasses, causes it to mix more readily with the massecuite, and prevents the formation of false grain, which might occur when adding a cold solution to a hot concentrated solution.

By the Java Process of Boiling, as introduced by K. R. Hamakers, two different strikes were made:

I.

Consisting of 5 to 5½ parts of syrup and 3½ to 4 parts of molasses, purity of massecuite obtained + 70°, yielding first grade sugar and a molasses of + 42 Purity.

II.

Consisting of 3 parts syrup and 6 to 6½ parts molasses. Purity of massecuite + 59, yielding first grade sugar and waste molasses.

This process was used in the Waialua mill for eleven weeks during the crop of 1904. For the remainder of the crop a method, which, for the sake of a name, will be called the "Old Process," was used.

By the Old Process three strikes were made:

I.

Consisting of 6 parts syrup and 3 parts molasses. Purity of massecuite + 78, yielding first grade sugar and molasses of + 56 Purity.

II.

Consisting of 3 parts syrup and 6 parts molasses. Purity of massecuite + 69, yielding first grade sugar, and molasses of + 44 Purity.

III.

Consisting of 1 part syrup and 8 to 8½ parts of molasses. Purity of Massecuite + 56, yielding a sugar which must be remelted, and waste molasses.

In comparing the value of any two methods, the same juice and machinery should be used, and the same conditions prevail in the trials of each method. This, however, is rarely obtainable in practical work. While the same machinery may be used, and the same conditions prevail, the juice is constantly changing, and the results change accordingly.

Comparing a juice of low purity with one of higher purity, we find—

(a) A juice of low purity takes much longer to boil.
(b) The yield of sugar per strike is less.
(c) The purity of the waste molasses is lower.
(d) The number of gallons of waste molasses is larger, causing a larger loss in molasses.

BOILING.

The time of boiling and the sugar produced per strike are very important considerations in sugar house work. A saving in time in boiling, and an increased production per strike, means an increased capacity of the boiling house and economy in fuel.

Table I shows the number of strikes, total sugar produced, and sugar produced per strike, by the two processes:

TABLE I.

	Total Strikers.	Total tons sugar Produced	Tons Sugar produced per strike
Old Process (A)			
17 weeks ending May 21, 1904..	663	10,016.5	15.11
Java Process.			
11 weeks ending Aug. 6, 1904...	362	6,029.5	16.65
Old Process (B)			
6 weeks ending Sept. 17, 1904..	176	2,635.94	14.98
Total Old Process...........	839	12,652.44	15.08
Total Java Process..........	362	6,029.5	16.65

The Java Process produced 1.57 tons more sugar per strike than the Old Process, or, while by the Old Process it took 839 strikes to produce 12,652.44 tons of sugar, by the Java process it would have taken but 760 strikes, or a saving of 79 strikes.

To see the true value of these figures, however, it is necessary to look at the *time* of boiling, taken by the two methods, and, as the purity of the juice exerts a great influence on the time of boiling, that also has to be taken into consideration.

Table II shows the purity of the syrup and the time of boiling by the two methods:

TABLE II.

	Purity of Syrup.	No. of Strikes.	Time per Strike
Old Process (A)			
17 weeks ending May 21, 1904......	87.5	663	8.29
Java Process.			
11 weeks ending Aug. 6, 1904......	85.4	362	10.56
Old Process (B)			
6 weeks ending Sept. 17, 1904.....	84.3	176	10.55

Here we have a strike of 87.5 purity taking 8.29 hours, and a strike of 84.3 purity taking 10.55 hours, both boiled by the same process. This clearly shows the influence of the purity the syrup on the time of boiling.

Combining Tables I and II we have—

TABLE III.

	Purity of Syrup.	No. of Strikes.	Hours per Strike.	Tons Sugar per Strike.
Old Process (A)				
17 weeks ending May 21, 1904..	87.5	663	8.29	15.11
Java Process.				
11 weeks ending Aug. 6, 1904..	85.4	362	10.56	16.65
Old Process (B)				
6 weeks ending Sept. 17, 1904...	84.3	176	10.55	14.98

Comparing the Java Process with the Old Process (B), both having nearly the same purity, we find that the Java strike took 10.56 hours to boil, and produced 16.65 tons of sugar, while the strike by the Old Process took nearly the same time to boil but only produced 14.98 tons of sugar. This means a saving of the number of strikes by the Java Process, and therefore a great saving of time.

For instance, the average time of all strikes during the crop of 1904 is 9.42 hours. Sugar produced, 18,681.94 tons.

To produce this sugar by the Old Process, it would have taken 1245.46 strikes of 15 tons each. By the Java Process it would have taken 1122.04 strikes of 16.65 tons each, a difference of 123.42 strikes. Each strike is equivalent to 9.42 hours, therefore this means a saving of actual boiling time of 1,162.62 hours. It took an average of one hour for the discharge of each strike.

Discharging, Old Process 1,245.46 strikes @ 1 hour .... =	1,245.46	hours
Discharging, Java Process 1,122.04 strikes @ 1 hour .... =	1,122.04	"
Total time saved by Java Process......	1,286.04	"
Time saved in discharging................	123.42	"
	1,162.62	"

This would allow 123.42 strikes to be made and discharged, or an increase in the boiling capacity of 9.91%. In other words the Java Process would have produced 12,681.94 tons of sugar in 17.86 days less time than it would have taken the Old Process to produce the same amount of sugar from juice of the same purity.

Actual figures are not at hand for the comparison of the centrifugal work of the two methods, but it may be stated that the number of machines needed to dry the sugar by the Old Process was more than sufficient to do the work by the Java

Process. About three-fourths of the crystallizers needed by the Old Process were used for the Java Process.

The figures given in the previous tables indicate that there should be a saving of fuel by working with the Java Process. Table IV gives figures showing the barrels of fuel oil burned per 100 tons of cane, and per ton of sugar, for the two methods:

TABLE IV.

	Bbls of oil.	Tons Cane Ground.	Bbls oil per 100 tons Cane	Tons Sugar Produce.	Bbls oil per ton of Sugar
Old Process (A)					
17 weeks ending May 21	3,688.88	82,574	4.47	10,016.5	.368
Java Process.					
11 weeks ending Aug. 6	773.50	46,700	1.66	6,029.5	.128
Old Process (B)					
6 weeks ending Sept. 17	518.68	21,927	2.37	2,635.94	.197
Total Old Process..	4,207.56	104,501	4.03	12,652.44	.333
Total Java Process	773.50	46,700	1.66	6,029.50	.128

During the first of the crop, (Old Process A), a large amount of maceration water was used. During the Java Process and Old Process B, the macerating water was less, and practically the same for both methods.

The figures expressed in barrels of oil per 100 tons of cane are more reliable for comparison than the figures expressed in barrels of oil per ton of sugar, as the amount of fuel oil burned depends more on the bagasse obtained from the cane than on the sucrose content and purity of the same.

These figures show that during the Java Process 1.66 barrels of oil per 100 tons of cane were burned, while by the Old Process (B), 2.37 barrels of oil per 100 tons of cane, were consumed. A difference of .61 barrels of oil per 100 tons cane, in favor of the Java Process. This, for the Crop, would be—

	Cane.	Bbls. of oil 100 per ton cane.	Total bbls. oil.
Old Process	151,201	2.37	3,583.46
Java Process	151,201	1.66	2,509.94

Bbls. oil saved by Java Process................1,073.52

MOLASSES.

The greatest loss in any stage of the manufacture of sugar is the loss in the final molasses. The amount of this loss is not indicated so much by the purity of the molasses as by the quantity of the same.

Table V shows the purity of the syrup and waste molasses and the gallons of molasses per ton of sugar for the crop of 1904.

TABLE V.

	Purity of Syrup	Apparent Purity of waste molasses	Gals. Molasses per ton sugar.
3 weeks ending Jan. 30, 1904..	88.09	34.9	28.7
7 " " Apr. 2, 1904...	89.10	34.1	24.2
4 " " Apr. 30, 1904..	86.6	32.5	27.4
3 " " May 21, 1904..	84.9	30.4	28.5
6 " " July 2, 1904..	85.8	33.0	34.4
5 " " Aug. 6, 1904..	84.9	32.7	40.1
6 " " Sept. 17, 1904..	84.3	32.1	44.2

It is evident from this table that the results of a syrup of 88 purity boiled by one process, and a syrup of 84 purity boiled by another process cannot be compared without making due allowance for the difference in purity of the two syrups.

Table VI shows the results of the boiling by the Old Process for the seventeen weeks ending May 21st, the Java Process for eleven weeks ending August 6th, and the Old Process for the remainder of the crop.

TABLE VI.

	Purity of syrup.	Apparent Purity of Molasses	Gals. Molasses per ton Sugar	Loss in Molasses %sucrose in Cane.
Old Process (A)				
17 weeks ending May 21, 1904..	87.5	33.19	26.75	5.10
Java Process.				
11 weeks ending Aug. 6, 1904..	85.4	32.9	36.9	6.68
Old Process (B)				
6 weeks ending Sept. 17, 1904..	84.3	32.1	44.2	7.97

The Old Process (A) shows a syrup of much higher purity and consequently better results than Old Process (B). The Java Process boiled a syrup slightly better in purity than Old Process (B), but obtained much better results.

The purity of the waste molasses in each case decreases with the purity of the syrup, while the gallons of molasses per ton of sugar and the lost per cent. sucrose in cane increases.

Comparing Old Process (A) with the Java Process, we find the syrup during the Java Process to have been 2.1 points lower, and the loss in molasses increased 1.58, or for each point less in purity of the syrup, an increase in losses of .75, a proportion of 100 to .75.

	Purity of Syrup.	% Sucrose lost in Molasses.
Old Process (A)	87.5	5.10
Java Process	85.4	6.68
Decrease in purity	2.1	Increase in losses....1.58
		Proportion.... 1 - .75

Comparing Old Process (A) with Old Process (B), we find this proportion to be 1.00 to .90.

	Purity of Syrup.	% Sucrose lost in Molasses.
Old Process (A)	87.5	5.10
Old Process (B)	84.3	7.97
Decrease in Purity	3.2	Increase in losses....2.87
		Proportion.... 1 - .90

Using the same proportions as given above, and taking a syrup of 85 Purity for both methods we have:

	Purity of Syrup.	% Sucrose lost in Molasses.
Old Process (A)	87.5	5.10
Java Process	85.0	....
Decrease in Purity	2.5	Proportion 1. to .75
		= increase in losses..1.88
Lost in molasses by Java Process		6.98

	Purity of Syrup.	% Sucrose lost in Molasses.
Old Process (A)	87.5	5.10
Old Process (B)	85.0	....
Decrease in Purity	2.5	Proportion .1 to .90
		= increase in losses....2.25
Lost in molasses by Old Process		7.35
Lost in molasses by Java Process		6.98
Difference in favor of Java Process		.37

This would at least prove that if syrup of the same purity was boiled by both methods, the loss in the molasses by the Java Process would not be more than the amount lost by the Old Process, and it would indicate that the loss would be less.

This statement is supported when one considers the low grade massecuite produced by the Old Process. This massecuite yields a poorly dried sugar (purity averaging 75), which is remelted and mixed with the syrup. The low grade sugar thus obtained is equal to 53.41% of the original massecuite.

Let x = low grade sugar	° Brix.	Purity.
We have Massecuite	95	56
	—	—
Sugar	97	75
Waste Molasses............		32.75

Then $.7275\,x + (95 - .97\,x)\,.3275 = 53.20$

$x = 53.41$

$= 53.41\,\%$

During the crop of 1904, there were made 110 low grade massecuites averaging 35 tons each, or a total of 3850 tons, yielding 2,056.28 tons of poorly dried low grade sugar, consisting of 60.94% of crystallized sugar.

Let x = sucrose crystals	° Brix.	Purity.
Sugar	97	75
Molasses		32.75

$(95)\,(.75) = x\,(100) + (97 - x)\,.3275$

$x = 60.94$

$= 60.94\,\%$

and 100—60.94=3906% waste molasses of 32.75 purity.

39.06% of waste molasses is equivalent to

$$\left(2056.28 \times \frac{39.06}{100} = 803.18\right)$$

803.18 tons of 130,598 gallons of waste molasses taken back and mixed with the syrup. The large amount of impurities thus taken back would undoubtedly have a great influence upon the amount of sucrose last in molasses.

	Old Process A.	Old Process B.	Java Process.
Purity of syrup................	87.5	84.3	85.4
Time of Boiling (hours)........	8.29	10.55	10.56
Tons sugar per Strike..........	15.1	14.98	16.65

	Process Old	Process Old	Java
Crystallizers used	16.	16.	12.
Centrifugals used	18	18	12 to 18
Apparent Purity of Molasses	33.19	32.1	32.9
Gallons of molasses per ton of sugar	26.75	44.2	36.9
% Sucrose lost in molasses	5.10	7.97	6.68
Barrels of fuel oil burned per 100 tons cane	4.47	2.37	1.66
Barrels of fuel oil burned per ton of sugar produced	.368	.197	.128

In summing up the results of the two methods we find that by working with the Java Process the loss in molasses, for the same purity of syrup would not be more, and would probably be less; that more sugar was produced per strike; less strikes were made; fewer crystallizers and centrifugals were used, and less fuel was consumed.

(Signed) HORACE JOHNSON,
Chemist, Waialua Agricultural Co., Ltd.

DIFFUSION BY CONTINUOUS AND FORCED CIRCULATION.

(Naudet System.)

By M. L. Naudet

From Bulletin de l'Association des Chimistes.

Every fabricant has heard something about the results obtained during the last campaign by my process of diffusion by forced circulation. Much has been done towards perfecting this process at the usines of:—Maing (North France), under M. Bernard; Neuilly-Saint-Front, owned by the Société des Sucreries de Fives-Lille; la Roche, at Gand, Belgium; Moerbeke, Belgium; and Azucarera Labradora, at Calatayud, Spain; not to mention others.

In each case the juices were clear and limpid, differing entirely from ordinary diffusion juices, and easily worked at the different stages of manufacture, the co-efficient of purity being increased, on this account, by at least 25 or 30 per cent. The first and second carbonatation juices were also of excellent quality, and quite beyond comparison with those of the same density obtained by the usual method. The syrups were limpid, clear, almost colourless, easily worked up in the pan, and yielded molasses which could be filtered without difficulty. In addition to these recognised advantages, the process affects a considerable economy in fuel, this being due to two causes. First, the diffusion juices were heated by the vapour from the first vessel of a triple effect, the second of a quadruple, or even the third vessels of a quintuple effect had a density corresponding to 85 per cent. of that of the normal beet-juice.

This economy is effected without great expense, it being unnecessary to increase the heating surface of the battery-heaters in order to utilize vapour from the first vessel of a quadruple or quintuple effect, which alteration is generally necessitated by the distance such vapours have to be conveyed. But, on the contrary, this is effected at small cost by passing the diffusion juice through the requisite number of re-heaters situated close to the evaporating apparatus, and requiring no special supervision.

The battery work is extremely simple. The circulation of the juices round the battery is not interfered with by the forced circulation through the individual diffusers. The juice is drawn off from the battery at a constant level, the motions of the juice in each diffuser being similar for each operation. There are no concussions caused by the sudden rupture of the column of liquid owing to the alternating speed in the flow of liquid; rapid during "meichage"* and slow during the drawing-off of juice.

The working of the battery is decidely superior in all these points, and, during the past campaign, we have only met with one slight inconvenience—we worked too rapidly to allow the battery to be under proper control. The juices moved freely without loss in saccharine richness; no accumulation of gases at the top of the diffusers impeded their working; there was no fermentation, because the slices were instantly sterilized in the terminal diffuser; the diffusion was so rapid that the battery operations had to be occasionally stopped, the juice not being evaporated as rapidly as it could be drawn from the battery. Some small inconveniences were therefore experienced. When the battery is stopped it does no work, although it is true that diffusion proceeds during a stoppage of, say, one minute, until equilibrium is established on both sides of the cellular membrances of the beet-cells; but, if the period of contact be prolonged, the salts continue to diffuse to the detriment of the purity of the juice. Consequently,

*The term "meichage" has no English equivalent, but refers to the introduction of rich diffusion-juice to the terminal diffuser, which has been charged with fresh beet-slices.

having numerous stoppages of from fifteen to twenty minutes each, amounting to a total of from two to three hours per day, time was not only lost, but the purity of the juices were unfavourably affected.

A more serious result of such stoppages was that the circulating pump had not a free delivery-outlet so that the pressure in the circulating main rose to a maximum of from two to three atmospheres. If, then, a valve was imperfectly closed, owing to a fragment of beet slice or other obstruction being interposed between the valve and its seat, the juice leaked into the exhausted diffusers so that after each stoppage, the extraction was less perfect than when the work was in full swing. I admit that, in the event of a stoppage, it is only necessary to stop the pump but this calls for the special attention of the workmen who will not trouble to stop the pump engine, believing the stoppage to be only momentary. This need not apply when the pump is driven by an electric motor, requiring merely the handling of a switch, but, as all usines have not this convenience, this point is worth considering.

As stated, we have only met with this single inconvenience which we have successfully remedied by arranging that every diffuser is in operation for a similar period of time, which is regulated by the head battery man without demanding any attention on the part of his assistants.

To-day, this process is complete in every detail and offers many well recognised advantages, permitting, moreover, a determined quantity of work to be completed each day, and which can be immediately and exactly controlled at will, in order to meet the requirements of the factory.

We herewith describe our process for the benefit of all who have requested information on the subject, also its special applications as under:—

1. For extracting hot juices in the Sucrerie.
2. For extracting cold juices in the Distillery.
3. For operating two batteries simultaneously.

the operations being similar in all three cases and based on the same principles.

DESCRIPTION OF THE PROCESS.

From investigations on diffusion prior to 1900 it is well known that the rapidity with which the juice is heated materially assists the diffusion, increasing the density of the juices and the degree of exhaustion of the cossettes. For a long time we were satisfied with drawing off 120, or more litres per 100 kilos of roots worked, and, recollecting how a battery was then heated, we obtained the following temperatures in successive diffusers:—

30, 45, 60, 75, 80, 80, 80, 75 &c.

In other words, the heating was graduated so that the maximum temperature was not reached until the fourth or fifth diffuser of the battery.

At that time, the juice-heaters were constructed with very small heating surfaces, which did not allow the juice to be rapidly heated to the maximum temperature. This defect was early recognised by investigators, one of whom, if not the first, was our distinguished colleague, M. Henri Pellet. Larger heating surfaces were adopted for heating the juice undergoing "meichage," and also for rapidly raising the temperature of the juice passing from one diffuser to another. The object was not, however, achieved satisfactorily although juices of higher density were obtained, and the volume drawn off reduced to 105 or 110 litres. Others, amongst whom were Melichar in Austria, and F. Garez in France, tried the effect of passing the juice intended for "meichage" through reheaters, so as to conduct this operation at the highest possible temperature; but this did not get over the practical difficulty of rapidly raising to its maximum the temperature of the juice entering the meichage diffuser from the one preceding it. The most important diffuser, namely, that which gives the juices its intensity and purity, had not, therefore, the temperature most favourable to diffusion. Working thus, we could not, except in certain cases, exceed a temperature of 80 without risk of gelatinizing the slices, and promoting fermentation by retarding the work, the gradually heated beet-slices not being able to bear a temperature as high as from 90 to 92 in the interior of the diffuser, which they might withstand without injury, when rapidly circulated under such conditions that this high temperature is not maintained in the diffuser for any length of time.

This is the condition I sought for, viz., to rapidly raise the temperature of the slices to the maximum, without exceeding the limit at which they gelatinize, by introducing the juice into the terminal diffuser at its maximum temperature, thus avoiding the gradual heating necessitated by the usual method of working. To attain this object it is necessary to return the more or less cooled juice, after heating same, to the top of the terminal or "meichage" diffuser, and as is well known, I effect this by means of a pump connected with suction and delivery pipe-mains. Last year, I succeeded in dispensing with the suction-main, adding, however, a "compensator," the object of which will shortly be evident. By this arrangement, I have perfected a battery possessing exceptional adaptability, answering all the requirements of my investigations, and which has been operated during the entire campaign with most satisfactory results, in ten or more usines.

This I proceed to describe, indicating, at the same time, the methods to be followed to obtain the principal advantage mentioned above—namely, the exact and instantaneous regulation of the working period of each diffuser under the control of the battery superintendent. The whole process depends upon the rôle of the compensator, which may therefore be first referred to.

THE COMPENSATOR.

I have elsewhere shown that if hot juice be introduced at the top of a diffuser filled with juice and fresh slices, if p is the weight of slices contained in the diffuser, then, in order that this weight (p) may be uniformly heated to the temperature of the entering juice, the latter must have the following weight:—

$$P^1=3\ p.$$

It is therefore theoretically necessary, for the success of my process, to introduce at the top of the diffuser, immediately after "meichage," a volume of juice equal to the three times the weight of the slices contained in that diffuser, and this operation must necessarily be completed during the time that a volume (v) is drawn off from the preceding diffuser and a volume (v^1) for the "meichage."

If we admit, as is approximately true, that the weights are proportional to the volumes, it follows that three volumes (v) should pass out of the diffuser under circulation during the time that two volumes ($v\ v^1$) escape from the preceding diffuser. We may therefore state that $v^1 = V$

and that $v = V+x$

x being the excess of juice drawn off over that used in "meichage," and x=0 if 110 litres of juice are drawn from diffusers containing 54 kilos of slices per hectolitre.

It is true that there are variations in the manner of charging the diffusers, but in proportion as this is more perfect my explanations will be the more accurate.

Under the above conditions, three volumes of juice must enter the diffuser for every two volumes passing out of the battery, and it is evident that, in order to attain this velocity, the pump must produce such a pressure as will tend to drive the slices into the perforations in the bottom plates of the diffusers, and, occasionally, through the same, like fish escaping through the meshes of a net; thus reducing the perforated area, hindering the circulation, and retarding the work of the battery.

If the suction of the pump be directly applied to the bottom of the diffuser the same phenomena occurs, but with even more diastrous results. This *rapid and forced* circulation through the diffuser can, however, be maintained without this inconvenience, and the apparatus employed I therefore call the "compensator."

This consists of a closed tank having approximately the same capacity as the diffuser but of relatively large diameter. It is erected in a suitable position on the battery-platform in such a manner that the lowest level of the contained juice may be just above the floor of the platform. We may next proceed to describe its action.

When certain valves are opened, the pump draws the juice directly from this tank, into which juice enters from the diffuser in such a manner that the increased volume of juice in the compensator exerts an upward counter-pressure through the bottom of the diffuser, preventing the slices from adhering to the perforated plate or passing through it. In practice it is found that this counter-pressure, and the working-speed of the battery, increase in proportion as the compensator is filled, thus proving that its action is as stated. This is the secret of operating the battery at its maximum speed, and, when once this was attained, the other inconveniences met with last year disappeared or were more or less counteracted.

The compensator also serves to equalize the temperatures. On referring to the pages of the Bulletin, it will be found that when the "meichage" was conducted with juice at 80 degrees and juice at 80 degrees also returned to the top of the diffuser during circulation, the following temperatures occurred:—

79, 78, 76, 72, 68, 64, 58, 52, 45, 39, 33, 29, 26, 28, 31,
36, 42, 48, 53, 58, 62, 66, 70, 72, 74, 76, 77, 78, 79.

If these juices are returned to the diffuser through a heater at the same speed as they are drawn away by the pump it will be impossible for these juices to collect in my compensator, into which there simultaneously pass the two volumes of juice at 80 degrees, namely, that to be drawn off and that required for "meichage." These five volumes intermix, yielding a mixture of approximately uniform temperature, and no longer varying from 25 degrees to 80 degrees, but barely from 4 degrees to 5 degrees.

PUMP, RE-HEATERS, VALVES, AND PIPE-MAINS.

A centrifugal pump should be employed which does not agitate the juice with the production of foam; we specially recommend the Schabaver Pump, which gives the required pressure and works smoothly. We have known these pumps to have given entire satisfaction during three campaigns, and they are perfectly adapted to the necessary variations in the work of a sucrerie.

We employ re-heaters, the tubes of which have a sectional area of 1 1-2 times that of the circulating main piping. According to their sie, the juice should be deflected six or eight times, the speed of flow of the juice through the tubes being at least 1.7 metres. Such apparatus, heated by steam at 100, should have a total heating surface corresponding to 0.20 square metres per ton of roots worked per day. We do not advise the use of high pressure steam which causes the temperature of the circulated juice to be much more irregular.

No special pipe-mains are required except those connecting the re-heaters to the diffusers, with a branch and valve on each diffuser. It is unnecessary and even objectionable to employ large valves; those of 100 are preferable for diffusers of from 40 to 50 hectolitres capacity. They close more easily than larger valves and there is less risk of leakages in the event of a stoppage. Several stop-valves, of the same diameter as those already mentioned, complete the description of the special apparatus required.

We may state that the adoption of the process would be much less costly in such usines as are already equipped with re-heaters, as all should be which are adopting modern methods.

AS APPLIED IN THE SUCRERIE.

Fig. 2 represents a battery of twelve diffusers (of 40 hectolitres capacity) furnished with the apparatus previously described. Two regulating valves, V and V¹, are there shown on the pipe-main leading from the re-heaters; the one, V, admits juice to the battery during forced circulation, the other, V¹, admits juice to the measuring tank. The capacity of the circulating pump is always calculated to deliver a larger volume of juice than that which can simultaneously pass by the valves V and V¹.

Suppose, then, that the fabricant wishes to operate one diffuser every five minutes, he must supply during that period 22 hectolitres of juice to the measuring tank through V¹ (namely, the volume drawn off per diffuser of 40 hectolitres capacity), also 60 hectolitres must pass into the battery through V. This can be arranged for before the campaign commences by adjusting these valves in the following manner: The pump being started, the valve V¹ is opened, or closed, so as to permit exactly the desired volume of juice to pass to the measuring tank in the required time. Similarly, this valve may be adjusted to allow the given volume of juice to be drawn off in 4, 4 1-2, 5, 5 1-2—up to 10 minutes; the various positions of the valve being recorded on a graduated arc fixed below an index pointer attached to, and moving with, the spindle of the valve. The position of the valve V, which should allow 60 hectolitres of juice to pass to the battery, in the given period, is similarly adjusted by filling a diffuser in 2-3 of the required time, and repeating this operation for the various periods to which the valve V^1 was adjusted, indicating the positions of this valve as before. Then, in order to operate one diffuser every five minutes, it is only necessary to move these two valves so that the indices move into the pre-determined positions, and, so long as the valves

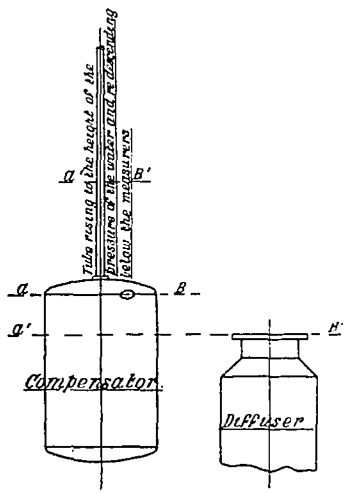

Fig. 1.—The Compensator.

are not interfered with, the time required for these two operations remains unchanged.

Let us suppose that Diffuser No. 4 is empty and ready for charging with fresh slices, also that No. 3 has already been charged and is under circulation, whilst, at the same time, the desired volume of juice is passing into the measuring tank. In order that the operations of meichage* and soutirage* should terminate simultaneously, the former, which should occupy only from 60 to 80 seconds, is not commenced until a certain number of hectolitres have been drawn off. Con-

*It is convenient to retain these two technical terms for sake of brevity, *Meichage* refers to the entrance of comparatively rich (but impure) diffusion juice to the terminal diffuser (*i.e.*, that diffuser last filled with fresh slices). *Soutirage* refers to the withdrawal of the final diffusion juice (of maximum density and purity) from the battery into the measuring tank.

sequently, the juice-inlet valve on No. 4 is opened after, say, 14 hectolitres of juice have been drawn from No. 3. The latter operation, *soutirage*, being completed, the level of the juice in the compensator returns to *a-b* (*Fig. 1*) by the law referring to communicating vessels. During soutirage, more juice leaves the battery than is returned to it by the pump, and the level of juice in the compensator rises. The capacity of the latter is so calculated that, when the battery work is most rapid, the compensator is completely filled before the

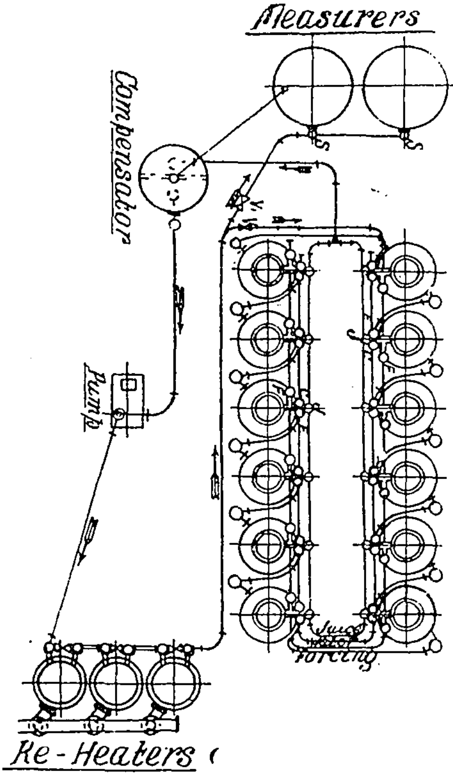

Fig. 2.—The Naudet Battery as adapted to treating Hot Juices in the Sucrerie.

meichage is commenced, so that the latter operation is very rapid, juice entering the terminal diffuser from the compensator as well as from the preceding diffuser. Consequently, whenever the battery operations are stopped, there is always a free passage for the juice into the partially filled compensator, and no time is lost in changing the diffuser, the rapidity of the work being thereby greatly facilitated.

Assuming that the battery supplies exactly the required volume of juice for meichage and soutirage during five minutes, what must the fabricant do when, finding that the battery is working too fast to maintain the proper density of the juice, he wishes to prolong the period of each diffuser to six minutes? Evidently, he has simply to adjust the positions of the valves, V and V¹, to the required conditions without having to give instructions to the men in charge. The compensator being filled with juice before the meichage is commenced, the juice rises in the vertical pipe until it automatically exerts a counter-pressure which diminishes the working-speed of the battery. As the juice under circulation meets with this counter-pressure (which is exerted in an upward direction through the bottom perforated plates of the diffuser) the working of the battery is slackened for the time being, but can be greatly increased a few hours later should this be necessary. In fact, we might say that the battery is checked for a certain period in order that the subsequent working may be hastened; and, instead of the difficulty usually experienced in regaining the normal working-speed, my battery remains capable of its maximum output at a moment's notice.

Another case may present itself. The battery is not supplying sufficient juice to the evaporators, so the valves, V and V¹, are adjusted to furnish the required volume of juice in four minutes. During the soutirage, which is somewhat more rapid, the compenator will not be completely filled and, during meichage, the level of the juice in the compensator descends below *a-b* (*Fig. 1*), the outlet-valve being partially closed by the motion of the float so that the movements of the juice are impeded. Soutirage is also retarded and is only complete when the level of the juice in the compensator again rises to *a-b*, that is to say, after 4 or 4 1-4 minutes; hence, the float automatically obstructs the free circulation which takes place when the outlet valve is fully opened.

It will therefore be evident that, by this method of working, no attention whatever is demanded from the battery-hands, the responsibility resting solely with the fabricant, who determines at what speed his battery should be worked in order to adapt the battery to the general requirements of the factory. The diffusion is continuous, yielding a juice of maximum density and spent slices containing a minimum quantity of sugar.

The fabricant need no longer fear that the battery-hands will snatch intervals of rest during the night spell by hurrying the operations in several diffusers, for he is provided with a better means of control than that furnished by the automatic registering apparatus generally adopted.

The meichage should be almost instantaneous; the juice, entering the diffuser with a mean temperature of 50 degrees, will scarcely have time to warm the fresh slices before being replaced by hot juice, which immediately has the desired effect. We stated last year that it was preferable to effect the meichage gradually and at a moderate temperature in order to avoid decomposition of the sugar, and this plan was adopted during the early part of the campaign. But, we have since proved by analyses that the colder juices, especially when working with frozen or rotten beets, dissolve the saline impurities quite as readily as juices at higher temperatures, and we have therefore decided to conduct the meichage as rapidly as possible and thus reduce the period of contact between the slices and the cooled juice—*i. e.*, at temperatures of from 30 degrees to 60 degrees as contrasted with hot juice of 80 degrees. After meichage with cooled juices of 80 degrees purity, the juice drawn off did not exceed 77 degrees purity after three minutes' contact (not counting the time occupied by meichage). Since increasing the speed of the meichage, the analyses indicate that the juice, entering the diffuser at 80 degrees, had almost the same purity as that drawn off by the pump, whilst the purity of the first portion of the circulated juice (which is cooled by contact with the fresh slices) rose to 81, that following to 82, then 83. These comparatively low purities were due to the inferior quality of the roots, the purity of which was from 76 to 79, and even as low as 69.

AS APPLIED IN THE DISTILLERY.

The great difficulty experienced in adapting our process to the distillery in 1901 arose from the fact that the juice must be drawn from the battery at a mean temperature of 30 degrees, or a maximum temperature of 35 degrees, whereas our process yields juices at higher temperature. It was therefore necessary to cool these juices either in a special apparatus or merely by contact with the fresh slices. In attempting to overcome this difficulty by the latter method, certain modifications had to be introduced which greatly reduced the output. The introduction of the compensator has since enabled us to realize our original idea—namely, to retain the method of working adopted in the sucrerie by re-arranging the various pipe mains.

As applied to the sucrerie, the juice leaving the diffuser during the latter part of the circulation had a mean temperature of from 32 degrees to 34 degrees under the following conditions:—

1. The *meichage* was conducted at 80 degrees.
2. The fresh slices had a temperature of 10 degrees.

It is, however, certain that the *meichage* could never have been made at a higher temperature than 65 degrees, and if the slices had a temperature of 10 degrees at the commencement of the campaign, towards the close of the latter their temperature was much lower and consequently the temperature of the juice drawn off between the first and later periods of the circulation would be considerably below 30 degrees.

The control of the battery in the distillery is identical with that in the sucrerie, with the exception that the valve V^1 is dispensed with, the valve V being adjusted as before. At the

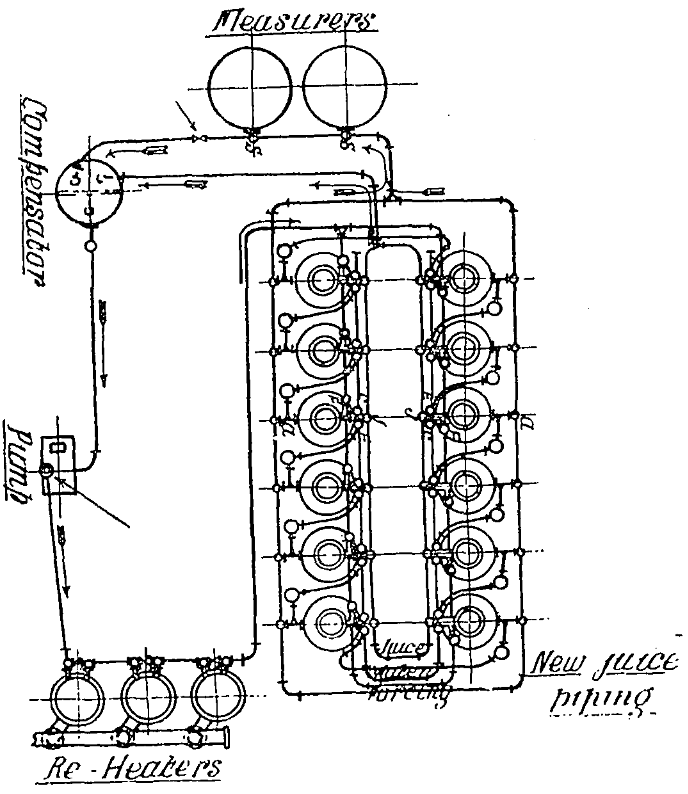

Fig. 3.—The Naudet Battery as adapted to treating Cool Juices in the Distillery.

commencement of the circulation, the temperature of the juice leaving the diffuser is between 65 degrees and 40 degrees, as indicated by a thermometer on the juice outlet pipe. When the temperature drops to 40 degrees (after about two minutes) the workman opens the valve leading to the measuring tank, simultaneously closing that connected with the compensator. The temperature of the juice then continues to fall during the *soutirage*, and only commences to rise when that operation is complete.

The workman then re-opens communication with the compensator, and closes the passage to the measuring tank, when, owing to the accumulation of juice in the compensator, the subsequent *meichage* is very rapidly effected.

If the battery works too rapidly, the motion of the juice is automatically regulated by the juice rising in the vertical pipe of the compensator until equilibrium is established. If it is desired to hasten the work, the compensator float influences the *meichage* as in the preceding case.

AS ADAPTED FOR OPERATING TWO BATTERIES SIMULTANEOUSLY

In this case also, our battery is controlled by the careful regulation of the *soutirage* to within a very few seconds of the required time.

The juice, to be drawn off from each battery, flows alternately to the compensator, and it is from the latter that the juice under circulation is drawn by the pump. Our two control-valves are adjusted to effect the circulation and the *soutirage* in one and the same period of time, 3 1-2 minutes for example. We need not here consider the *meichage*, which is conducted in each battery whilst disconnected from the compensator, and which is consequently more rapid than the *soutirage*.

Under these conditions we have the following results:—

1. The battery furnishes the desired volume of juice in 3 1-2 minutes, the circulated juice returning to the battery during the time that juice is being drawn off to the measuring tank. The level of the juice in the compensator remains at *a-b* (*Fig. 1*).

2. The battery furnishes more juice as soon as the level of juice in the compensator rises in the vertical pipe to a point at which the counter-pressure equals that of the battery; this level will be a^1-b^1, for example.

3. The battery furnishes less juice when the level of juice in the compensator descends between *a-b* and a^1-b^1, the motion of the float then partially closes the outlet valve, causing a retardation of the *soutirage* and forced circulation, and tending to hasten the working speed of the battery.—Inter. Sug. Jour.

THE DIFFUSION OF MEGASS.

It is well known that "dry" double crushing fails to extract all the sugar contained in the cane. To improve the extraction attempts have been made to macerate the megass, as it leaves the first mill, with hot water, so that after the second crushing, the residual juice is diluted and, consequently, the sugar-content of that juice diminshed. We shall presently show that this maceration is a very imperfect method; a fact which is, moreover, evident a priori.

Suppose, for example, that it is desired to reduce, by one-half, the sugar-content of the residual juice in single-crushed megass. It will be necessary to macerate this megass with a quantity of water equal in weight to the residual juice which it contains. Even assuming that the mixture of water and juice is perfect; in other words, that the water instantly penetrates the cellular masses of the megass at the moment of its addition, the maceration process still presents certain inconveniences which are only partly compensated by its advantages, since the gain in the sugar which results is at the cost of a very considerable dilution.

To solve this problem successfully without abandoning the principle it is necessary to change the method of operating, and the "diffusion" of megass affords a very perfect method of maceration for the following reasons:—

1. The megass is brought into contact with a series of liquids of diminishing saccharine richness, in such a manner that, instead of the residual juice being diluted in a single operation, it is submitted to a graduated series of dilutions, which permits the extraction of juice from the megass to be carried much further with but a small addition of water.

2. The admixture of the residual juice with the surrounding liquids is rendered certain by a prolonged contact of the megass with these liquids, and by a suitable temperature.

We may here briefly refer to the direct diffusion of the cane, which gives equally good results from the point of view of extraction, but which necessitates the costly slicing of the cane into chips, the use of a large number of diffusers, and many operators, and which yields a more dilute juice than that obtained by the combination of dry crushing with diffusion of the megass; moreover, the fuel obtained by this process is difficult to re-crush, and is very inferior to the megass resulting from double-crushing.

We now proceed to give some figures extracted from the records of large usines where the diffusion of megass has been recently installed:—

The cane contained about 12.2 per cent. of sugar and 10.5 per cent. of fibre, and the method of extraction consisted in "dry" double-crushing of the cane, diffusion of the megass, and double-crushing of the exhausted megass in order to dry it for use as fuel.

The dry double-crushing yielded about 66 litres of juice per 100 kilos of cane. With maceration there was obtained, on the contrary, 85 to 87 litres of 1.053 density, containing about

68 litres of normal juice, and from 17 to 19 litres of added water.

In the diffusion of the megass, from 23 to 26 litres of juice were drawn off per 100 kilos of canes. This juice contained about 13 litres of normal juice (that is to say, the greater part of the residual juice contained in the double-crushed megass), and from 10 to 13 litres of added water. On mixing these 23 to 26 litres of juice (1.040 density) with the 66 litres of mill juice 1.067 density), there were obtained about 91 litres of juice at 1.060 density per 100 kilos of canes.

The direct diffusion of sliced cane, of the same saccharine richness, would yield about 105 litres of juice at 1.051 density per 100 kilos of canes.

The quantity of sugar lost per 100 kilos of canes may, therefore, be approximately stated as follows:—

2.25 kilos by dry double-crushing.
1.95 " double-crushing with maceration.
0.50 " dry double-crushing and diffusion of megass.
0.50 " direct diffusion of sliced cane.

These results were obtained in the diffusion of megass when the waste waters from the re-crushing mills was returned to the battery in such a manner that the small quantity of sugar they contained was not lost. Under these conditions, the only loss of sugar was that contained in the waste waters which the powerful re-crushing mills failed to extract from the exhausted megass. But this method of utilizing the waste waters has been discontinued since it was found that they were liable to ferment; the battery was then supplied with fresh water, but this practice has been abandoned in favour of the former.

The working of the battery is simple, four battery hands being sufficient to conduct the diffusion when treating about 800 tons of canes per day. The only supervision necessary consists in seeing that the juice is brought to the proper temperature, that the extraction and the density of the diffusion juice are satisfactory, and that the alkalinity of the juice is sufficient.

The battery consists of 10 diffusers, whereas the direct diffusion of cane requires at least 16, and often 18, diffusers.

A usine adopting diffusion of megass therefore requires:— Two cane mills for dry double-crushing, or one crusher and a mill. Ten diffusers with carries and elevators for handling the megass. Two re-crushing mills with carriers leading to the furnaces.

The latter mills may be smaller than the cane mills and require less power. Even a single mill might be employed, but the megass should be rendered as dry as possible if it is to be burned without preliminary drying in the sun.

Dry double-crushing generally furnishes sufficient fuel to meet the requirements of a usine because the mills extract a relatively small quantity of juice which is also of a high density. It should, however, be noted that such a usine utilizes sugar as part of its fuel owing to the imperfect extraction of juice from the megass. It is quite evident that such working is neither rational nor economical.

On comparing the evaporation of 66 litres of juice at 1.067 density which give 17.7 litres of syrup at 1.25 density, with that of 91 litres of juice at 1.060 density which give 21.8 litres of syrup at 1.25 density, it is found that, in the case of megass diffusion, it is necessary to evaporate 21 litres more water per 100 kilos of cane than in the case of dry double-crushing; that is to say, 5 litres per body of a quadruple effect without reheaters; but, on the other hand, recovering about four additional litres of syrup per 100 kilos of canes.

It is therefore easy to calculate the economy realized by the diffusion of megass, and this will be still more remunerative when the older usines are equipped with modern methods of re-heating the juice. The question of the total extraction of sugar from the cane is intimately connected with that of a well arranged evaporation plant. This problem of the total and economical extraction will only be solved when, in every cane sugar factory, the multiple effect evaporator is regarded as a sceondary boiler, intended to furnish the necessary heat to the various departments of the factory—Journal des Fabricants de Sucre.

SUGAR AND ITS SUBSTITUTES.

By Dr. Harvey W. Wiley, Chief Chemist United States Department of Agriculture, Washington, D. C.

The rapidly increasing consumption of sugar as a food product has long since eclipsed its old use as a condimental substance. The wisdom of diminishing the internal revenue tax on sugar, in accordance with a resolution of the Brussels Congress, has been manifested in France and Germany, especially by the enormous increase in domestic consumption. This increase bids fair to take care of even more sugar than these countries were enabled to send abroad under artificial stimulation of official bounties and the corporate kartel.

The utilization of waste products of sugar factories, especially the molasses and beet pulp, for cattle feeding purposes, has opened a profitable avenue for disposing of these bodies in a manner helpful to the industry. The utilization of bagasse from the sugar cane mills, either as fuel or as paper stock, has enabled the sugar grower to transform this waste product, which was often a burden on his hands, into a source of profit. The improved and cheaper methods of clarification whereby practically the whole output of a sugar factory can be converted into white sugar suitable for the market, have placed in the hands of individual factories the means of securing the extreme profit of the retail price and has thus advanced the interest of the industry in a marked degree.

It is perfectly certain that this increase in the consumption of sugar will keep pace with the increase in population. Many countries where the consumption of sugar has been kept very low by the high price artificially placed upon it by duties, both customs and excise, will doubtless have an opportunity in the near future to enjoy the luxury of cheaper sugar. We may expect, therefore, to see the increase in consumption, which has already been seen in Germany and France, extend to Italy, Spain and Russia.

With raw sugar, free of tax, at a cost of not to exceed two or three cents a pound, it does not seem reasonable to suppose that any substitute for sugar will be sought after. With a price of five or six cents a pound, however, which prevails as a retail price in this country, substitutes for sugar are used in certain industries. I do not speak in this sense of substituting any one kind of sugar for another, as, for instance, when dextrose or levulose or glucose is used in the place of sucrose. Such a substitution is only fraudulent when the consumer is unaware of its character. In my opinion there can be no reasonable objection to the use of another sugar in the place of sucrose, provided no deception is practiced. There are, however, certain very sweet substances which are not sugars, but which are convenient to use for certain purposes. I refer especially, as you may already have foreseen, to the use of that coal tar product, known as saccharin, for sugar. Its use is perfectly justified when prescribed by a physician, as, for instance, in cases of diabetes, where the use of sugar and other carbohydrates in the food is reduced, by order of a physician, to a minimum. Any craving for sweet tastes, in such cases, is satisfied by the substitution of saccharin for the prohibited sugar. When, however, saccharin is used in food products for the purpose of giving a sweet taste which the consumer would naturally suppose to be due to ordinary sugar, the practice must be considered as an adulteration and a fraud. It seems to me that this should be the designation of any such practice, aside from any judgment of the character of saccharin itself.

Whether or not it is an antiseptic, it seems to me, has nothing whatever to do with the case. Its use as above is a fraud and as such should be prohibited.

I, of course, have no sympathy with that kind of legislation which assigns a false reason for its existence, when, for instance, a law is passed prohibiting the use of saccharin in food products upon the ground that it is injurious to health, if the real reason is simply to prevent its coming into competition with sugar. It seems to me the lawgivers should not assign a false reason. I am, however, far from committing myself to the theory that saccharin is harmless. Further evidence is needed on this subject. At least this one thing seems to be agreed upon, namely, that saccharin undergoes little or no change in passing through the organism. It is excreted principally by the kidneys in practically the same form in which it is ingested. In this respect it throws an additional burden upon the kidneys, requiring them to dispose of a foreign substance not needed in the food. But we may waive that point for the present and regard the use of saccharin solely in its fraudulent sense.

It has been stated, for instance, in the packing of sweet Indian corn that the addition of sugar gives it an additional sweet taste, but at the same time causing it to ferment the more readily, whereas the addition of saccharin, which gives a sweet taste of equal intensity, tends to prevent fermentation. Of course if this statement be true it proves simply that saccharin is an antiseptic since it is evident that if sugar is added to sweet Indian corn and the mass thoroughly sterilized, no fermentation will take place, whereas by the addition of saccharin, even with an imperfect sterilization, fermentation will not take place.

I am not arguing here for the propriety of adding sugar to Indian corn when it is canned. Even this process may be regarded as to some extent fraudulent, since it permits a corn which is not sweet to masquerade as one which is. At any rate, whenever a consumer notices a sweet taste in canned Indian corn be attributes it either to the sugar naturally present in the corn or that which has been added, and in this he should not be misled.

In this brief discussion of the substitution of saccharin for sugar I simply point out what seems to me to be the real attitude of the manufacturer toward the consumer. I believe that the manufacturer should never practice any process which is deceptive. Every article of food which he produces should stand upon its merits and its nature should be known to the consumer.

The question just now is not whether saccharin should be prohibited in food, but whether it should be used in a deceptive manner or in such a way as to lead the consumer to believe that it is real sugar. Every sugar producer should be interested in seeing that consumers who want to eat sugar have the privilege of doing so, and the consumer who does not want to eat sugar certainly should not be compelled to do so. In like manner the consumer who wants to eat saccharin should have that privilege in so far, at least, at I am concerned, and the consumer who does not want to eat saccharin should not be compelled to do so, especially under the supposition that he is eating sugar.

The whole sugar producing world, it seems to me, is interested in this question, because, if a sweet substance which is not sugar can be substituted for the real article, not only is the consumer deceived, but the manufacturer of sugar is shut out of a market which justly belongs to him.—American Sugar Industry and Beet Sugar Gazette.

INTERSTATE SUGAR CANE GROWERS' ASSOCIATION

Third Annual Convention Assembles in Montgomery, Ala., January 25, 26 and 27, 1905.

The following call for an interstate cane growers' convention deserves the immediate attention of all sugar producers. In the interest of the domestic sugar production this convention should be attended also by beet sugar producers. Much can be done by personal intercourse toward a better organization for mutual protection and for the promotion of the common aims of both beet and cane sugar manufacturers. It is to be hoped that this convention will be well attended.

To those interested in the cultivation and manufacture of cane syrup in the states of South Carolina, Georgia, Florida, Alabama, Mississippi and Louisiana:

In 1767 the first sugar cane grown within the present limits of the United States was planted in the vicinity of New Smyrna, on the Halifax river, in Florida, and sugar was manufactured from it.

In 1806 sugar cane was first planted in Georgia, and in 1825 seed cane from this stock was carried to Louisiana, and is the base of her best cane seed to-day.

In 1781 Morin, a Cuban, made the first sugar manufactured in Louisiana, and Etienne De Bore in 1794 produced it on a commercial basis, the centennial of which event was celebrated in 1894 with considerable eclat.

In 1829, on Hopeton plantation, near Brunswick, Ga., James

Hamilton Couper, the most advanced agriculturalist of his day, erected a sugar mill for grinding his own sugar cane, of which he was planting from 300 to 500 acres annually and converting it into sugar, when Georgia was the rival of Louisiana as a sugar state.

During the war between the states, 1861-65, Florida produced large quantities of sugar, which was in great demand at that time, owing to the blockaded condition of southern ports.

After the lapse of near a half century a revival has taken place in this nearly forgotten crop, as a commercial industry, and it is to take advantage of this revival that the Interstate Sugar Cane Growers' Association was organized at Macon, Ga., May 6, 1903, for placing the cane industry again upon a commercial basis.

The second convention, held at Jasksonville, Fla., May 4-6, 1904, was largely attended by delegates from South Carolina, Georgia, Florida, Alabama, Mississippi and Louisiana, the soils and climates of these states being equally adapted to the successful cultivation of sugar cane.

The third annual convention has been called to convene at Montgomery, Ala., January 25, 26 and 27, 1905, and it is fully expected that this convention will show as splendid work as its predecessors in the results of its labors.

In connection with the revival of the cane industry it is equally important that we confer over methods of economical manufacture, and the not less important matter of ready and reliable markets for that part of the manufacture that shall result in the production of table syrups, which, on account of climatic conditions, will be the form in which practically all of the product will be marketed in the northern half of the cane belts of the cane-producing states.

Hon. James Wilson, secretary of agriculture; Dr. H. W. Wiley, chief bureau of chemistry, U. S. department of agriculture; Dr. W. C. Stubbs, director of Louisiana Sugar Experiment Station, New Orleans, La.; Prof. B. B. Ross, state chemist, Auburn, Ala.; Prof. J. M. McCandless, state chemist, Atlanta, Ga.; Prof. W. L. Hutchinson, director of Mississippi Experiment Station; Hon. John Dymond, editor of Louisiana Planter; Hon. E. J. Watson, commissioner of agriculture and immigration, South Carolina; Mr. W. B. Roddenberry of Cairo, Ga.; Col. R. R. Poole, commissioner of agriculture, Alabama, and other distinguished speakers will be present and address the convention.

The aim of the committee, in selecting speakers and essayists for the occasion, has been to make it educational in every branch of the subject, and historical in the evolution of every sugar-producing plant within the limits of the United States, upon the broadest lines of thought, experience and actual results.

The composition of the convention, to make it thoroughly representative, will consist of delegates as follows: Five delegates from each county or parish in each state named above, appointed by the governor of the state.

Each sugar cane planters' association is entitled to five delegates; each agricultural association, five delegates; each commercial organization, five delegates; industrial departments of railroads, two delegates each, and each state agricultural department, two delegates.

Besides the delegates who will comprise the convention, an invitation is extended to the manufacturers of syrup and sugar machinery to be present at the convention, where ample arrangements will be afforded for bringing them in close touch with producers of cane and its manufacture, for interchanging views looking to the adaptation of machinery to the present needs of the cane industry in most of the states comprising the convention, and for exhibits of machinery.

The convention has been called to assemble in the commodious quarters of the Commercial and Industrial Asociation at Montgomery, Ala., January 25, 26 and 27, 1905, at 10 o'clock sharp.

The railroads traversing the several states comprising the convention have published a rate of one fare, plus 25 cents, for round trip to the convention, and tickets will be on sale several days in advance of the assembling of the convention, at all railroad ticket offices in the territory named.

Committees of the Commercial and Industrial Association will arrange for accommodations in hotels and private boarding houses at moderate rates for all delegates and visitors to the convention. Further information can be had along this line by addressing Mr. L. L. Gilbert, secretary of Commercial and Industrial Association, Montgomery, Ala.

The convention will be promptly convened at 10 o'clock on Wednesday, January 25, and it is earnestly desired that each delegate time his departure from home so as to be present at the opening of the convention.

Visitors from all parts of the United States are most cordially invited to be present, and are assured a most hearty welcome at all sessions of the convention.

D. G. Purse, President, Savannah, Ga.
R. E. Rose, First Vice-President, Tallahasse, Fla.

Second Vice-Presidents:

C. G. Abercrombie, Ala.
C. K. M'Quarrie, Florida.

Thos. J. James, Georgia.
John Dymond, Louisiana.
H. H. Overstreet, Miss.
John Lawton, S. Car.

Executive Committee:

G. W. Black, Alabama.
A. L. Wilson, Florida.
G. R. Youmans, Georgia.
L. M. Soniat, Louisiana.
B. M'Clanahan, Miss.
W. S. Lipscomb, S. Car.

J. A. Hollomon, Treasurer, Jacksonville, Fla.
R. M. Martin, Secretary, Savannah, Ga.

THE SUGAR INDUSTRY IN QUEENSLAND.

It seems quite impossible to make our politicians understand that in dealing with the Queensland sugar industry they must, if they desire to do justice, consider separately and apart from each other first that portion which is carried on in the southern part of the State, in which the climatic conditions do not very greatly differ from those of the northern portion of New South Wales; and secondly, that of Northern Queensland, where they are nearly akin to those of Java or India. Lack of local knowledge is one of the chief penalties we have to pay for vesting the control of a number of states differing so widely in the matter of climate in the hands of a central parliament, the members of which show no indication of any desire to improve their knowledge of the vast territory for which they have to legislate. It will, indeed, be a good thing if the invitation of the Queensland Premier to the Federal members of Parliament to visit the sugar districts, in a steamer to be provided for their accommodation at the expense of the Government, is freely accepted. It is, however, to be feared that few but the Labour members, who have nothing else to do, will go, and their minds are already made up.

There is no senator who knows more about the sugar industry of Nort Queensland, and of Cairns in particular, than Mr. Givens. He has canvassed the constituency, and is probably in constant communication with it, yet in the face of the account of the great meeting of planters held there some weeks ago, at which many of his old supporters spoke, and of which he doubtless had the fullest details, he has asserted that "it has been proved that coloured labour is not necessary to the growth of sugar." No one disputes that sugar can be grown by white labour south of the tropic of Capricorn, but at the Cairns meeting to which I have referred it was overwhelmingly demonstrated that, while there was an ample supply of white labour in the south, three years' experience had proved beyond doubt that not only were white men unable to perform field work in tropical Queensland, but they would no longer try.

Some months ago the "Herald" gave an account of last season's experiments of the Johnstone River sugar planters in regard to white field labour, and now follows the testimony of Cairns. Three years ago most of the farmers determined to go in for white labour only, and they were able to get a fair supply. Last year the supply was poor, and this year there was none.

The pathetic part of the business is that most of the speakers at the meeting had been earnest supporters of Sir Edmund Barton's White Australia policy, and prepared to sacrifice some of their profits in an honest endeavour to find work for their unemployed countrymen in the south. But though they stuck manfully to White Australia she has left them in the lurch. The principal speaker at the Cairn meeting, Mr. Peterson, a Dane, with a large family of sons, who is well known in the north as a good farmer and one of the pioneers of the Herbert, said he had registered for the bonus as a grower of sugar by white labour, but this season being utterly unable to procure white men he had been compelled to go back to coloured labour, thus not only forfeiting his bonus, but losing the extra cost of the white labour which he had paid for two years to secure it. The pay offered for white labour was such that any man able to do the work could earn from 7s to 8s a day; yet, though there are hundreds of men receiving Government relief in Brisbane, only two offered their services for planting.

Another farmer said he now realizes that the objection of the Labour party to kanakas was not on account of their vices, but of their virtues. They were too reliable—they would not strike. All agreed that if the white farmers were to carry on the sugar industry in the north the Federal Government would have to take steps to find labour for them. Italians were willing to come and try the work, but the immigration laws forbade their being indented, so there seemed to be nothing for it but to allow the farmers to retain the kanakas.

The fact is, as has been so often pointed out in the columns of the "Herald," that white men—at all events those available in Australia—cannot do field work in the tropics for any length of time. As was pointed out at the Cairns meeting, as soon as any earn 20s or 25s they "give it best;" nor do they ever remain if any other work, such as mining for wolfram, offers itself.

Italians cannot, under our laws, be imported, but if they could it is open to question whether they would prove quite reliable even if the climate might not be too much for them. There is a big difference between the climate of Cairns and even the extreme south of Italy. Messrs. Neame Brothers, of Macknade, on the Herbert (where the climate is somewhat more temperate than at Cairns) got out a lot of Italians before their introduction was forbidden by law under conditions very favourable to the law arrivals. They were to work for wages for a term of years, and then to become tenant farmers, Messrs. Neame Brothers undertaking to provide them with suitable land and purchase their cane. All went well for a while until a labour delegate was sent up from Townsville to point out to them what much higher wages they could make by working in the Charters Towers mines. The result was that all but a few absconded. Those who remained are now mostly well-to-do farmes, but they employ coloured labour for field work. The fact that the absconders did not get work on the mines is perhaps beside the question, but it may not be without its moral.

Since the Cairns meeting another has been held in Townsville, at which all parts of the north were represented, and, with one dissentient, a prominent labour advocate, all declared that it was impossible to continue to carry on the industry without the assistance of coloured labour.

It is unfortunate that just about the time of the Cairns meeting the Brisbane Collector of Customs went on tour through the Bundaberg district (alluded to by the Vice-President of the Executive Council as No. 3 sugar district), and reported that there was an abundant supply of white labour. Insomuch as the assurance bears upon the North Queensland question, it would be equally to the point to have said that there was plenty of white labour on the Richmond River, but it was at once seized upon by the misinformed and the disingenuous as an argument against the retention of the kanakas. It is lamentable indeed that so important a person as the Vice-President of the Council should have, in common with the ordinary southern senator, been led astray by this statement.

It is satisfactory to note that Senator Trenwith appears to have to some extent an open if somewhat misinformed mind on the question, and maintains that rather than let the industry perish, and that we should be compelled to admit the product of the black man from other countries, it would be better to employ our own coloured labour, controlled by proper laws. However, he qualified his remarks by saying that his experience was that a white man could do anything a black, could and do more work in the same time. No doubt in a temperate clime he can, but in the tropics the black man can "run rings" round the white at most work, and can do certain work—cutting, trashing, hoeing, and planting which the white man cannot do at all. Mr. Kingston said at Newcastle that he was certain white men could do field work in the tropics, because he had seen them stoking in the Red Sea. But he forgot to point out that the run up the Red Sea is only a matter of five or six days, and that too often the white stokers succumb to heat apolexy.

At any rate, it has been abundantly proved that white men will not tackle field labour in Nort Queensland, the richest of our sugar districts, and capable, under wise laws, of enormous possibilities—for immense areas of the best sugar land remain as yet untouched—and that unless coloured labour is at once found for the planters the industry must either perish or, as was pointed out in the columns of the "Herald" a little white back, pass into the hands of the Chinese.

While the Vice-President of the Executive Council declared that Mr. Reid had no intention of asking Parliament to extend the time for the deportation of the kanakas, Mr. M'Lean, who at least seems to take the matter seriously, assured a deputation that the Government would regard the collapse of the Queensland industry as a disaster. But, he added, the Cabinet had not considered the matter. Nero fiddled while his capital burned. What are Federal Ministers doing while a great industry, which feeds many thousands of white people, is perishing?

It has been amply shown that under the existing law the industry must either go to the wall, or pass into the hands of the Chinese. It may be an open question whether it were better for the industry to disappear or pass under the control of the Chinese, which would mean the congregation of most of the Mongolians in the Commonwealth along our north-eastern littoral, and the formation of an Asiatic colony—imperium in imperio—for with the chief industry at its command the Chinese octopus would speedily embrace the others. Where once the Chinaman plants his foot he keeps it. But if the white planter has to give up it is not in our power to prevent the Chinaman from taking his place. The white planters have sounded their note of warning. They have frankly told us that Chinese capitalists have offered to take over the show if for lack of labour the whites have to give in; but we cannot be surprised that, failing action being taken to enable them to carry on the industry, probable sellers do not take us further into their confidence.

We must, unless something be speedily done, be prepared to hear any day that the Chinaman is in possession. He will soon make his territory productive. He will grow the sugar, coffee, and rice the white man would, if Parliament would let him have the requisite labour. But all the profits of Chinese industry will go to China, whence all the new planter will consume will come. All that Australia will see of his money will be the duty on his imported goods, which would about pay us for policing him.—A. H.—Sydney Bulletin Herald.

AUSTRALIAN SUGAR PRODUCTION.

At the present moment when the question of sugar supply is creating such a widely-spread amount of interest, not only in the United Kingdom, but also in other countries, some facts in connection with Australian sugar production may not be out of place. The immense area embraced by the States forming the Commonwealth, and consequent diversity of climate, enables a greater variety of agricultural produce to be obtained than in any other country, with the exception, perhaps, of the United States. In Queensland and the northern portions of New South Wales almost every description of semi-tropical crop can be grown, including cotton, tobacco, and sugar. Although the earlier settlers in Queensland were familiar with the fact that sugar could be easily grown, like rice, arrowroot, and other semi-tropical products in their midst, its systematic cultivation is of comparatively recent origin, the extensive employment of imported coloured labour assisting the work of development. Operations were, however, conducted in a somewhat primitive fashion, each sugar grower having his own crushing mill, while there was considerable loss occasioned by the waste of juice. All this is now a thing of the past. During the early part of 1904, New South Wales had 20,219 acres under sugar cane, mostly in the northern coastal districts, the output being 227,511 tons of cane. In 1903 the area was somewhat larger. The Queensland area under sugar cane in 1903 was 111,516 acres, the largest yet recorded with the exception of 1901, when it was 112,031 acres. The greater part of the field work in Queensland has hitherto been performed by coloured labour, chiefly that of South Sea Islanders, or kanakas, as they are generally designated. In New South Wales it was formerly done entirely by white labour, but latterly numerous Asiatics, chiefly Hindoos, have been employed. Under Federal legislation no South Sea Islanders are now permitted to enter the Commonwealth, and after December 31st, 1906, all kanakas found in Australia will be deported. At present Chinese are taking the place of the kanakas, but, with attention to climatic conditions, the work could be performed by many classes of Europeans, especially from the countries of the Mediterranean. In the southern portions of the Queensland sugar country coloured labour is not essential, but the supply of white labour is largely a matter of wages. It is estimated that in Queensland there are many thousands of acres suitable for sugar cultivation which have yet to be placed under tillage, and it is also stated that in the Northern Territory of South Australia there are extensive districts in which sugar can be grown at a profit. In New South Wales many of the sugar growers formely grew maize as an alternative crop, but now they are combining the two with dairy farming, finding the three industries a source of considerable profit. Nearly the whole of the Australian sugar cane is purchased by the Colonial Sugar Refining Company, the headquarters of which are in Sydney, and which has extensive and well-equipped sugar mills in Queensland and New South Wales. In Queensland the State Government advances money on mortgage for the construction of sugar mills on the co-operative principle. There are about fifteen of these establishments, the cost of each ranging from £60,000 to £20,000, according to size and capacity. They are fitted with the best machinery, and managed by experienced men. The total cost was over half-a-million sterling. Their early success was hindered by the great drought and other untoward conditions, but they are now beginning to answer the expectations originally formed. There is a duty of £6 per ton on sugar imported into the Commonwealth, the excise duty being fixed at £3 per ton; but a bounty, equal to £2 per ton, is allowed on all Australian sugar grown by white labour. In 1902, 85 per cent. of the New South Wales sugar was grown by white labour, in Queensland the proportion was only 14 per cent. In 1898, Queensland produced 163,734 tons of sugar, the highest output recorded for that State, 1,542,090 tons of cane being crushed, yielding sugar at the rate of 1.99 tons per acre. In 1902, owing to the dry season, only 641,927 tons were crushed, but the juice attained such a high degree of density that 76,626 tons of sugar were produced, only 8.38 tons of cane being required to make a ton of sugar. It is estimated that the decrease of 538,000 tons of cane on the return of the previous year represented a loss of £486,500, of which the growers' share, with cane at 10s per ton, would be £269,000. Of the 641,126 tons of cane produced in Queensland in 1902, 10.9 per cent. was produced in the southern or Bundaberg district, 33.5 per cent. in the central or Mackay, and 55.6 per cent. in the northern or Cairns district, which possesses the warmest climate of the three. It has been estimated that the Australian consumption of sugar is about 179,000 tons per annum. In average years the production is about 142,400 tons, necessitating the further production or imporation of 36,600 tons. The countries from which sugar is most largely imported into the Commonwealth are Java, Mauritius and China.—(From John Plummer, New South Wales.)

During the ten months ending October, 1904, the United States imported 18,911,168 gallons of molasses valued at $977,320, against 19,204,431 gallons valued $1,207,628 in 1903, and 13,395,469 gallons, valued at 849,118 in 1902; 225,211,168 pounds of beet sugar not above No. 16 Dutch standard, valued at $4,816,226, against 19,803,559 pounds valued at $333,800 in 1903; and 232,646,591 pounds valued at $3,307,543 in 1902; 3,419,738,018 pounds of cane sugar not above No. 16 Dutch standard, valued at $69,944,531, against 2,968,574,084 pounds valued at $54,636,065 in 1903, and 3,026,652,338 pounds valued at $48,556.686 in 1902; 19,216,017 pounds of sugar above No. 16 Dutch standard, valued at $664,550, against 17,061,838 pounds, valued at $489,964 in 1903, and 67,268,538 pounds valued at $1,320,472 in 1902.

THE MEXICAN SUGAR INDUSTRY.

By D. Bankhardt, Editor El Hacendado, Mexico.

The sugar industry of Mexico, one of the most important industries of that republic, has made considerable progress in the last ten years. But it is especially since 1899 that pronounced improvements have take place, in the methods of production as well as in the quality of the sweet article.

The sugar crop of the campaign of 1899-1900 produced 75,000 tons of white sugar of three degrees which was brought to the market in the shape of loaves or cones, each weighing one arroba or about 25 pounds.

The campaign of 1903-04 produced 122,000 tons of sugar, an increase of 37,000 tons in four years. The loaves have now generally disappeared, and their place has been taken by white graulated and by cubes in cases. It is expected that the coming campaign will produce about 120,000 tons of sugar of a superior quality for domestic consumption, and that the European markets will receive about 20,000 tons of white centrifugal, moscovado, and Demerara.

In the course of the last five years five comparatively important factories have been erected, each with a daily capacity of about 500 to 600 tons of cane, and equipped with the most up-to-date machinery.

The high prices for raw sugar now paid in the British markets are instrumental in bringing great prosperity to those countries which, like Mexico, can take advantage of the Brussels sugar convention and export the surplus production of sugar, leaving barely enough of the article in the country to cover the domestic demand till the next campaign.

Last year the Mexican sugar producers formed an association under the name of Union Azusarera Mexicana, whose president is Mr. Ygnacio de la Torre, the son-in-law of the president of the republic and proprietor of two magnificent haciendas and sugar mills baptized Tenextepango and Santa Clara and situated in the state of Morelos. Since then the sugar question has been settled in a manner satisfactory to both the producer and the consumer, and in the course of last year the Union Azucarera regulated the domestic sugar prices so that rich and poor alike could satisfy their appetite for sweets. The total sugar consumption of the republic amounted to 1,000,000 arrobas more last year than during the preceding year when the sugar trust, which failed soon after the Union Azucarera was founded, raised the price so high that it was left with one-half of its stock on its hand at the time when the new crop was due, so that it had to export its stock at a loss in order to liquidate its obligations.

Although it is very true that all Mexican sugar factories are not employing the best methods of manufacture which are in use in other countries, it is nevertheless certain that many factories are introducing modern machinery and using the best methods, naturally with excellent results. Many haciendas are also installing chemical laboratories which are so necessary for the analysis of sugar contents of the cane and the appreciation of the value of the finished product.

Considering the possibility of exporting sugar to foreign markets, the ease with which cane may be grown in Mexico, and the cheap cost of production which is lower than in any country, it is undeniable that Mexico will be able to rival with the greatest cane sugar producing countries of the world.

The supply on January 1, 1905, amounted to 450,000 tons, and as most of the mills now grinding are manufacturing export sugar, it may be assumed that this figure is sufficient to supply the home demand until the new crop comes into the market.

The great factories of the Compania Azucarera del Panuco at Santa Fe, San Cristoba and Paraiso Novillero, all of them situated near the Atlantic coast, are engaged with their entire output for the export. One single London firm has advanced funds covering about 10,000 tons of sugar. There are, besides, other factories which together will export about 2,000 tons of sugar, so that about 12,000 tons are scheduled for the export trade during the first three months of the new year.

In the capital of Mexico, a monthly sugar journal under the name of Hacendado Mexicano is published. It is the official organ of the Union Azucarera Mexicano, and contains information about the Mexican sugar industry, sales of land and opportunities for investment, prices of production, transportation facilities, etc. The address of this paper is located at 2010 Ciudad de Mexico.

SUGAR IN FORMOSA.

The total production of sugar cane during 1903 amounted to 406.640 tons, and of sugar to 34,000 tons. These figures show decreases of 49 and 38 per cent., respectively, when compared with the figures of the preceding year. These extraordinary decreases probably resulted from the enforcement of the sugar-consumption tax throughout the Empire from October 1, 1901, which rendered unprofitable the careless and wasteful methods of cane growing and sugar manufacturing practiced by the Chinese. During the past five years this industry has received considerable attention and encouragement from the industrial department of the Formosa government, which has introduced for distribution among the planters the Rose Bamboo and Lahaina varieties of Hawaiian cane; has purchased several modern sugar mills, which, after the economy in their use was demonstrated, were lent to manufacturers without charge; has granted tracts of land for cane cultivation, and has improved irrigation facilities. This has given a new impetus to the industry, which is passing out of the hands of Chinese to the control of Japanese syndicates, who are applying modern and economical methods, and large tracts of land are being prepared for cane cultivation. Under the new condition of affairs this industry has a very promising future.

The results already obtained from the introduction of the Hawaiian varieites of cane have been extremely favorable. These varities not only produce an enormous increase in the yield of cane per acre, but the percentage of saccharine content obtained is much higher than from the varieties heretofore grown in the island. In order to replace the old varieties with the Hawaiian as rapidly as possible, the industrial department will establish one or more plantations for the growing of shoots for distribution in each prefecture in the cane-growing districts. These plantations will be under competent directors, from whom planters in their respective vicinities may receive suggestions in the culture of cane; also a school of instruction in cane growing and sugar manufacturing is to be established at the government experimental gardens at Taimokuko, in the district of Tainan, in which a class of 50 students will be given a two-year course.

Of the sugar produced during 1903, 22,345 tons, or 63 per cent., were shipped to Japan; 1,988 tons, or 5 3-4 per cent., were shipped to China, and the balance remained in the island for consumption.—(U. S. Consular Reports.)

THE PRICE OF SUGAR.

The following letter appeared in *The Times* of 9th December: To the Editor of the Times:

SIR,—It is difficult to make the general public understand how absolutely unfounded is the present cry that the abolition of bounties has made sugar dearer. The following figures will convince any one who will have the patience to read them carefully.

The European beetroot crop of 1901-2, stimulated by enormous cartel and other bounties, produced 6,720,000 tons of sugar. The supply was so excessive that prices went down to 6s. per cwt., which is at least 3s. per cwt. below the European average cost of production. At the end of that season, on September 1, 1902, the account stood as follows:—

	Tons.
World's stocks, September 1, 1901......	1,086,000
World's visible production, 1901-2......	10,964,000
Total supplies, 1901-2..............	12,050,000
World's visible consumption, 1901-2....	10,004,000
Stocks, September 1, 1902..............	2,046,000

This stock was about 1,500,000 tons in excess of the requirements to carry us over into the new crop. This, and the ruinous price, caused the sowings to be reduced in the spring of 1902, in spite of the fact that the bounties would continue for another 18 months. The beetroot sugar production in Europe amounted in 1902-3 to 5,570,000 tons, a reduction of 1,150,000 tons, and prices recovered—prematurely as it turned out—to 8s. per cwt., a price still below the European average cost of production.

It is evident that this reduced production and increased price was the effect of the over-production caused by the bounties, not of the distant prospect of their abolition 18 months afterwards.

But in spite of this reduction the glut of sugar caused by bounties continued, as shown by the account at the end of the season 1902-3:—

	Tons.
Stocks, September 1, 1902..............	2,046,000
World's visible production, 1902-3......	9,912,000
Total supplies, 1902-3..............	11,958,000
World's visible consumption, 1902-3....	9,915,000
Stocks, September 1, 1903.............	2,043,000

In 1903 the European beetroot crop was increased to 5,880,000 tons, in spite of the fact that bounties were about to be abolished before the sugar could come on the market. This increase was quite justified by the anticipated increase in European consumption when duties and surtaxes were reduced. The account at the end of the season stood thus:—

	Tons.
Stocks, September 1, 1903..............	2,043,000
World's visible production, 1903-4......	10,403,000
Total supplies, 1903-4..............	12,446,000
World's visible consumption, 1903-4.....	11,019,000
Stocks, September 1, 1904..............	1,427,000

Thus the excessive stocks had been reduced from 2,043,000 tons to 1,427,000 tons. This was still excessive and had been fully anticipated. Prices therefore for some months at the beginning of this year remained at the low figure of 8s. to 8s. 6d. per cwt.

Clearly the abolition of bounties had had nothing to do with this small rise in the price of sugar. If the beetroot crop this year had given a normal yield, it would have produced about 5,700,000 tons of sugar. We have also a reliable estimate of what the rest of the world will produce, and can, therefore, frame a prospective account of how matters would have stood at the end of the season. The consumption will not attain the figure of last season, which was abnormal owing to the depletion of invisible stocks previous to the European reductions of duty on September 1, 1903. But, even taking it at nearly that figure, we get the following account for 1904-05:—

	Tons.
Stocks, September 1, 1904..............	1,427,000
European beetroot crop, about..........	5,700,000
The rest of the world's production......	4,782,000
Total suplies, 1904-5................	11,909,000
World's consumption, say even.........	11,000,000
Stocks, September 1, 1905..............	909,000

This is more than enough to carry us over to the new crop, and would have justified no rise in the price of sugar, a fact confirmed by the quotations for the first three months of this year.

But when the summer came it was evident that the new beetroot crop was in great danger from persistent dry weather, and prices began to rise, standing at 9s. 7 1-2d. on July 1. At a later period, when reliable estimates of the crop could be made, it was found that, instead of 5,700,000 tons of sugar, it would not, even at the most sanguine estimate, yield more than 4,950,000 tons. The account at the end of the season will, therefore, be:—

	Tons.
Stocks,September 1, 1904..............	1,427,000
Estimated European beetroot crop......	4,950,000
The rest of the world's production......	4,782,000
Total supplies, 1904-5.............	11,159,000

Consumption must evidently be reduced or we shall have no stock to carry us on into the next crop.

The present situation is another instance out of many that have occurred during the last 20 years of bounties, showing how completely the bounties have made the world's price of sugar dependent on the state of the beetroot crop. Now that bounties are abolished we shall gradually but slowly escape from this bondage. Free competition will allow sugar to be produced in larger quantities elsewhere, and probably in some new countries, so that eventually the beetroot crop, though still remaining an important factor, will cease to be so absolutely the governing factor in the price of sugar.

Messrs. Icke and Sharp, in their reply to Mr. Chamberlain, as published in The Times of Saturday, do not hesitate to repeat the unfounded assertion that the Brussels Convention "increases the price to us." I have shown that at all events the present increase of price is not in any way due to the Brussels Convention, except in so far as it has increased the consumption of sugar—a great blessing to all producers. But let us look a little deeper into the question, beyond the mere figures of the present situation. The bounties created "glut, collapse, and ruin," as the late Lord Farrer very truly said. The glut gave us for the time very low prices, the inevitable collapse brings reduced production, a temporary scarcity and high prices. The confectioners would have liked to have sugar provided for them in perpetuity at the price of 1902, which was 3s. per cwt. below the cost of production, and they cry out loudly because a reduced supply—not caused by the Convention—has deprived them of that impossible boon. But what would have happened if bounties had continued and the price of 1902 had been maintained a little longer? Not only would every natural producer have been shut up, but even the smaller bounty-fed ones would have been driven out of competition. Your readers can easily imagine what the price of the sugar would have been under those circumstances, and may wonder what the confectioners would have said then. This is a lesson for fiscal réformers to ponder over; still more for those who oppose reform and declare artificial cheapness to be "free trade."

I am, sir, yours faithfully,

GEORGE MARTINEAU.

Gomshall, December 5.

STATISTICAL POSITION OF SUGAR IN JANUARY.

Czarnikow, Macdougall & Co. report under date of January 13 and 20 as follows:

> For a day or two after our last report refiners showed a lack of interest in the offerings of raws put before them and, in particular, deprecated paying the advance of ⅛c. over last week's prices which was demanded by Cuban holders. Meanwhile, European beets were being quoted at higher prices every day until on the 10th inst.; the price for January had reached 15s. 10½d. f. o. b., as against 15s. 0¾d. on 6th inst.
>
> An advance of 9¾d. per cwt. (3-16c. per lb.) in Europe could hardly be ignored by buyers, particularly as it made the price of beets equivalent to 5.40c. landed for 96° Centrifugals, whereas the asking price of Cubas was equivalent to only 5.12c. landed, it was, therefore, not surprising that one of our in-

dependent refiners came into the market late on 10th inst. and scooped up all the Cuban offerings except those for early shipment, thereby securing nearly 30,000 tons Cubas mostly for March-April shipment. Next day other refiners came into the market and took about 20,000 tons Cubas, San Domingos, etc., on same terms.

The demand did not extend to nearby or spot sugars and in order to effect a sale, owners of a small quantity of Cubas in port had to make a concession of 1-16c. on the prices obtained for sugars some weeks off. The market closes very strong for sugars in all positions and with practically no offerings of Cubas or of other sugars in quantity.

More recent reports as to crop conditions have led to a reduction of 25,000 tons in the estimates for the Philippines and of 16,000 tons in the estimates for Barbados. It is probable that some reduction may also have to be made in the Trinidad figures, reports from that Island being unfavorable. From Porto Rico, where an increase of 25,000 tons had been expected, our cables state that heavy rains are interfering with grinding.

The advance in European beets above referred to, was succeeded by a reaction of 3d. per cwt. on speculators realizing, but this was immediately followed by a recovery which has brought prices up to 16s. 1½d. f. o. b. for January-February and 16s. 3¾d. for May. Next crop October-December delivery, has at same time advanced to 12s. 0¾d., at which price there are buyers. These prices represent an advance for the week of 1s. 0¾d. in January, 1s. in February, 11½d. in May and 7½d. in next crop.

The high prices ruling in Europe for beets are causing an increased inquiry on the part of United Kingdom refiners for cane sugars, and they will absorb all the old crop Javas still afloat. They have already bought a considerable quantity of next crop Javas, shipment from June up to August, and a June-July cargo has just been placed with them at 14s. 9d. c. f., equal to 4.97c. landed United States. So far, only moderate purchases of next crop Javas have been made for United States account, but later, when the scarcity of raw sugar becomes more marked, our refiners will no doubt seek the relief from this quarter which, in recent years, has never failed them. This year, however, competition of European buyers has entirely altered the Java situation.

Business in raw sugars has been checked by the higher prices asked by sellers, and although the attitude of buyers generally, has been one of indifference, there are some among them who have shown their confidence in the situation by picking up all the sugar that was to be had at prices below those ruling in Cuba.

The quantity thus secured does not exceed 5,000 tons, but even that small quantity could only be got by the payment of an advance of ⅛c. to 3-16c. over last week's prices, the smaller advance being on prompt sugars and the larger one on sugars for February-March shipment. Latter have been sold at 3 15-16c. c. f., which is, so far, the highest price of the year, and is equal to about 5.30c. landed.

The last important sale of Cubas was made ten days ago, when 40,000 tons were taken at 3¾c. c. f., equal, say, to 5.11c. landed. At that time prompt beets were 15s. 10½d. f. o. b., which is equivalent to 5.40c. for 96° Centrifugals. In the interval, prompt beets advanced to 16s. 3¾d., but the closing price is 16s. 1½d. f. o. b., equal to 5.45c., while for Cubas the price now asked is 4c. c. f., which is equal to 5.36c. landed. It will thus be seen that while ten days ago the value here of cane sugars, as represented by Cubas, was .29c. below the beet parity, the difference today is reduced to .09c. and that, consequently, a reaction of 6d. per cwt. in beets would bring them into competition with cane sugars in this market.

The statistical situation and the present strength of European markets make such a decline improbable, but at the same time the narrow margin between the importing cost of beet and cane should prevent too high pretensions on the part of cane producers.

Willett & Gray under date of January 26, report as follows:

Visible Supply.—Total stock of Europe and America, 2,755,857 tons, against 3,728,868 tons last year at the same uneven dates and 3,722,480 tons at the even date of Jan. 1st, 1904. The decrease of stock is 968,011 tons, against a decrease of 980,526 tons last week, and an increase of 209,885 tons January 1st, 1904. Total stocks and afloats, together, show a visible supply of 2,866,857 tons, against 3,868,868 tons last year.

Raws.—As anticipated the week under review (Jan. 19-20) opened rather firmer with sale to speculator of Cuba Centrifugals for April shipment at 3 31-32c.

c. and f. (equal to 5.34c. landed), basis 96° test, showing 1-32c. advance from the price paid by refiners at outports. The improvement was of short duration, however, because of the very considerable decline which took place in European markets, brought about by political troubles in Russia. Offerings here increased and holders showed more disposition to meet the demand freely, with the result that sales were effected on the basis of 3⅞c. c. and f. for 96° test Cuban sugars for February-March and April shipment, equal to 5¼c. landed and showing a decline of 1-16c. from price last paid by refiners for distant sugars.

San Domingo and Porto Rico sugars for shipment were also sold on the same parity.

Spot sugars showed practically no change, refiners accepting all offerings of nearby parcels on the basis of 5¼c., for 96° test.

The market for the present may be considered steady and firm at 5¼c. for Centrifugals in any position.

European markets, after touching 16s., 3¾d. for beet declined to 15s. 8¼d. from which point it slowly rallied until 15s. 11¼d. was reached today, with speculators again buying because of improved Russian politics. Future deliveries of beet at the close are quoted 16s. 3d. for May; 16s. 4d. for August and 11s. 9¾d. for October-December.

A further increase is reported by our cable advices from Cuba in the number of Centrals grinding, 164 now being at work against 149 at this time last year. The only serious complaint from the planters being the scarcity of railroad cars.

New crop Javas are offered at 16s. c. and f. for May-June, 15s. c. and f. for June-July and 13s. c. and f. for August-September shipment.

After a period of quietness, we expect that the strength of the position, based upon supply and demand, will again become the prominent feature and, if not checked by political troubles, an improvement will set in.

F. O. Licht in his monthly report, dated January 14, says:

Our preliminary estimate of the European beet sugar production will compare with the preceding campaigns as follows:

	1904-05	1903-04	1902-03	1901-02	
Germany	1,590,000	1,927,681	1,762,461	2,305,013	tons
Austria	905,000	1,167,959	1,057,692	1,301,548	"
France	620,000	804,308	833,210	1,123,545	"
Belgium	170,000	203,446	224,090	324,960	"
Holland	135,000	123,551	102,411	203,193	"
Total	3,420,000	4,226,945	3,979,864	5,258,259	tons
Russia	940,000	1,206,907	1,256,311	1,098,983	"
Other Countr's.	335,000	431,116	325,082	393,236	"
Total	4,685,000	5,864,938	5,561,257	6,750,478	tons

Thus, the campaign 1904-05 is giving hopes of a decrease of about 1,180,000 tons against its predecessor; but we must point out again, that reliable figures for 1904-05 can not yet be given.

The production of beet sugar during the first four months shows a decrease of 721,000 tons, against the preceding year. Imports show for Europe and North America together a surplus of 258,000 tons, for Europe alone a such of 45,000 tons, while the stocks on September 1st, in Europe and North America together, were 411,000 tons smaller, in Europe alone 294,000 tons smaller, than 12 months previously. From the sum of these 3 groups of figures, there results for Europe and North America together a decrease of 874,000 tons, and for Europe alone a such of 970,000 tons. At the end of December, the stocks in Europe and North America together were 816,000 tons, in Europe alone 827,000 tons smaller than 12 months previously, and the consumption, taking into account an increase of 15,000 resp. 13,000 tons in the Exports, showed during the 4 months a decrease of 72,000 tons, for Europe alone a decrease of 156,000 tons. But for the twelvemonth ending end of December, there results for Europe and North America together a surplus of 681,000 tons, for Europe alone a surplus of 472,000 tons.